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ABSTRACT

An ethnographic study was conducted with the goal of evaluating the botanical concepts of sixth-grade students. One aspect of the study involved examination of the levels of abstraction students use for naming plants. Nine sixth-grade students were interviewed individually. Each was asked to identify the plants seen in a set of 64 slides and examined in two outdoor sessions. The generic and life-form levels of naming were both found to be salient, but the generic level apparently was preferred for naming plants. In addition, avoidance strategies emerged post hoc from the data. When students did not know the names for plants, concerns about admitting ignorance or being wrong both appeared to influence their responses. The implications for the classroom teacher dealing with these student concerns are discussed. An introduction, purpose, method, findings, discussion, and conclusion are included. (Author/KR)

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A PLANT IDENTIFICATION TASK

AVOIDANCE STRATEGIES IN CHILDREN

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the National Association for Research in Science Teaching
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A PLANT IDENTIFICATION TASK

AVOIDANCE STRATEGIES IN CHILDREN

Abstract

An ethnographic study was conducted with the goal of evaluating the botanical concepts of sixth grade students. One aspect of the study involved examination of the levels of abstraction students use for naming plants. Nine sixth grade students were interviewed individually. Each was asked to identify the plants seen in a set of 64 slides and examined in two outdoor sessions. The generic and life-form levels of naming were both found to be salient, but the generic level apparently was preferred for naming plants. In addition, avoidance strategies emerged post hoc from the data. When students did not know the names for plants, concerns about admitting ignorance or being wrong both appeared to influence their responses. Student concerns have implications for the classroom teacher.

Introduction

In the field of anthropology, numerous studies have been conducted on the botanical knowledge of groups of people, mostly in technologically underdeveloped cultures. In recent years, ethnobotanical studies have focused on cultural linguistic development through an examination of names for plants.

Out of their ethnobotanical studies, Berlin, Breedlove, and Raven (1974) developed a model for analyzing the layman's concept of the hierarchical relationships of biological organisms. In the model, the unique beginner class forms the top of the hierarchy. The categories plant and animal are typical layman's names for objects at the unique beginner level. These names represent the most abstract level in the hierarchy. The next level is the life-form class. This level typically includes categories such as tree, bush, vine. Below the life-form is the generic class. Included in the life-form tree, for example, one finds such generic names as oak, maple, ash. Below the generic level is the specific class. Names such as live oak, Spanish oak, red oak are specific names for oaks. Live oak is a less abstract name than oak. Oak is a less abstract name than tree.

In ethnobotanical studies in small-scale rural societies, Berlin et al. (1974) and Brown (1984) found that the generic level was salient in naming plants and animals. Berlin et al. believe that the generic level is psychologically basic. Generic names occur in every language and are probably among the first

plant names children learn. Numerous studies have been conducted that support the hypothesis that the salience of the generic level of naming may be a cross-language universal principle.

Stross (1973) conducted a developmental study with Mayan children and adults. He found that at age two, the children already knew a variety of generic names for plants. By age 12, the children could correctly identify about as many plants as could a below-average adult, around 200.

In contrast, Dougherty (1972, 1979) found that children in California (ages three to eight) have few generic names for plants. Dougherty believes that the life-form is salient for children in the United States. Brown (1984) documented the frequency of written words in American English and found that the life-forms tree, grass, bush and vine were among the most frequently used plant terms. Brown believes that the life-form is salient in large-scale urban societies.

Technological and agricultural advances result in less reliance on wild plants for food, shelter, and medicine. As societies advance technologically, members of that society tend to lose knowledge of generic names for plants. Berlin (1972) speculated that as individuals lose knowledge of wild plant names, they are more likely to rely on life-form names for plants. They are more likely to call an object a tree than an oak.

Most ethnobotanical studies have been conducted with adult informants. Few ethnobotanical studies have been conducted in urban societies and fewer on children's names for plants in those settings. The author does not feel that there is currently enough data to support the hypothesis that the generic level is no longer basic for people in large-scale urban cultures. More studies are needed, particularly with children in urban cultures.

Purpose

An ethnographic study was conducted with the goal of evaluating the botanical concepts of sixth grade students in central Texas (Tull, 1990). One aspect of the study involved examination of the levels of abstraction children use for naming plants. The author sought data relating to the relative salience of the life-form and generic levels of names for plants in a large-scale urban culture. Out of analysis of the data, response patterns emerged post hoc which the researcher also found worthy of reporting.

Method

Nine sixth grade students were interviewed individually. The informants were volunteers from a public school in a medium-sized

university town in central Texas. Each was asked to identify the plants seen in a set of 64 slides and plants examined in two outdoor sessions. The outdoor interviews were tape recorded and verbatim transcripts were produced. The open-ended outdoor interviews served as a triangulating source of data to check the validity of data from the more highly structured slide task.

The author used the taxonomic model of Berlin et al. (1974) to analyze the levels of abstraction used by children in naming plants. The researcher coded the informant's plant names. The following aspects of the names were coded and tabulated: generic name, specific name, life-form (including any name more abstract than a generic, i.e., life-form, unique beginner, or any intermediate levels of abstraction). In addition, accurate responses (common names used by adults in the culture) and inaccurate responses were coded and tabulated.

In a post hoc examination of the responses, the researcher found that many responses did not fit into the above designations. For example, some students frequently gave no answer or said, "I don't know." In addition, the types of errors students made naming plants were of interest. The researcher examined student responses and developed codes for the following additional aspects of the names: non responses; cases in which the informant said, "I don't know"; made-up generic names; descriptions given spontaneously, with and without a name. The results were quantified as numbers and percentages. Refer to the appendix for a summary of the results.

Findings

If the informant had a strong preference for using generic names (oak rather than tree), one would expect that he or she would use a high percentage of generic responses and a low percentage of life-form or more abstract responses. All the children used generic names for more than 30% of their responses. Thus, the generic level does have salience. Only four informants used generic names for more than 50% of their responses, however, and all the children used life-form names for a significant portion of their responses (from 15-65% of all responses). It is apparent that for these children the life-form level also has salience in naming plants. The question that follows is, does one level have more salience than the other?

For the answer to that question, the author reviewed other aspects of the responses. All informants displayed a poor knowledge of correct generic common names for plants. No one used more than 32% correct generic names, and five informants had less than 20% correct generic names.

When the informant did not know the correct generic name, he or

she was forced to give an alternate response. Research by Dougherty (1972) and Brown (1984) suggests that when the informant does not know a generic or specific name, the individual is likely to substitute a life-form name. In this study, it was found that the child may resort to other types of responses as well. The response types given by the 12 year old children in this study can be summarized as follows: correct generic responses, incorrect generic responses (guesses), made-up generic names, specific names (correct or incorrect), life-form (or more abstract names, correct or incorrect), a description given with or without a name, no response, or the response, "I don't know."

The appendix lists in detail the frequency with which each child used each type of response. The data summary in Table I indicates how many students used each response type in greater than 20 or 30 percent of the cases, or how many used each response type five or more times. The row labeled "average of tasks" is based on an average of percentages from both tasks. The row also indicates how many students used a response type more than 5 times on either task.

Specific names were used so seldom that they were not examined further. For purposes of percentage tabulation, the number of specific names was lumped with number of generic names.

TABLE I

Number of Children Using each Response Type

	Response Type								
Type of Task	Life-forms[a]	Generics[a]	Correct Generics[b]	Incorrect Generics[b]	Made-up Generics[c]	Life-form Described[c]	Description Alone[c]	"I don't know"[c]	No Response[c]
Slides	7	8	4	9	4	4	0	4	2
Outdoor Sessions	9	7	3	8	2	6	5	4	1
Average of Tasks	9	9	4	9	4	6	5	6	2

[a] > 30% of responses

[b] > 20% of responses

[c] 5 or more cases

All nine informants used incorrect generic names for some of their responses. Four informants used made-up generic names on a

fairly regular basis. Seven children either gave no response or said, "I don't know," on a fairly regular basis. Five children provided a description rather than a name more than five times. All of these types of responses resulted in a reduced reliance on life-form names when generic names were not known.

Discussion

The research was designed to examine which level of abstraction was most salient for children when naming plants. Both generic and life-form levels were found to be salient. The researcher found that the informants relied on a variety of strategies to cope with their lack of knowledge of generic names for plants.

The researcher feels that the use of a variety of alternate responses when lacking a correct generic name indicates that the children want to avoid a more abstract response. The frequent use of guessed and made-up generics indicates that even when they did not know the correct generic name, the children preferred a generic response to a more abstract response. The technique (used regularly in the slide task by four informants) of adding a descriptive phrase to a life-form name indicates a desire to identify the plant at a less abstract level. Saying, "I don't know," giving no response, or providing a description rather than a name also resulted in avoidance of an abstract response when the child did not know the generic name.

Six informants used a combination of three or more of the above response strategies. Two others used two of these techniques on a regular basis. The only informant (number 8) who did not rely on these strategies to avoid an abstract response still used generic responses more than 30% of the time.

The fact that the informants used life-form names frequently indicates that, even though they preferred generic names, other concerns influenced how they responded. Several of the response strategies mentioned above also had the affect of protecting the informant from an admission of ignorance. Substituting life-form names, using made-up generic names, or giving an educated guess (often the guesses displayed knowledge of related species or similar forms) all enabled the informant to avoid admitting that he or she did not know the correct response. In addition, providing a description rather than a name or giving no response at all could both be viewed as ways in which the child avoided admitting ignorance. Never saying, "I don't know," also served to mask ignorance. In this study, seven informants used three or more of the above techniques.

To avoid admitting ignorance a student must often risk giving a wrong answer. Several of the response strategies served to protect the child from giving a wrong answer. Substituting

life-form names (tree, bush, vine) usually resulted in an increase in the percentage of total correct responses. The informant could also avoid giving a wrong response by providing a description rather than a name, or giving no response at all.

If the informant feared giving a wrong answer, he or she might avoid guessing or using made-up names. Thus the informant might have a low percentage of generic responses. If admission of ignorance was equated in the mind of the student with giving a wrong answer, a higher use of life-form names might be preferable to saying, "I don't know." Eight informants used three or more techniques that resulted in avoidance of giving a wrong answer. For six informants, both concerns about admitting ignorance and giving a wrong response appeared to affect their response patterns simultaneously.

Thus three avoidance patterns emerged when students did not know the correct generic name for a plant: avoidance of an abstract response, avoidance of admission of ignorance, and avoidance of being wrong. All the informants in this study used one or more of the above avoidance strategies. Table II summarizes which avoidance patterns were exhibited by each child.

TABLE II

Avoidance Strategies in Children

	Informant Number								
Avoidance Strategy	1	2	3	4	5	6	7	8	9
Avoids abstract names	x	x	x	x	x	x	x		x
Avoids admitting ignorance	x	x	x	x		x	x		x
Avoids being wrong	x	x	x	x	x	x		x	x

It should be noted that the avoidance techniques described above did not result in names that would be acceptable to a science teacher, but various strategies had the effect of hiding the students' lack of knowledge and preventing a "wrong" answer.

While the generic level was salient for all of the children, the life-form level had salience also. Only two informants used a low percentage of life-form names in their responses. Nonetheless, eight children exhibited a desire to avoid abstract responses when lacking knowledge of the correct generic names. For all informants, fear of admitting ignorance and/or fear of giving a wrong response also seemed to influence their responses.

Conclusions

The results of this study have significance for science curriculum development, for classroom teachers, and for the study of cultural linguistic development. The results indicate that children in large-scale urban societies prefer generic names over more abstract names for plants, even when life-form names have become nearly as common in the language. The results suggest that the generic level remains psychologically basic even when knowledge of generic names is lost. Further studies are needed with both children and adults to discover whether this trend is widespread in other urban cultures.

The author believes that children wish to name plants at the level of abstraction at which they are capable of discriminating between them, and that is the generic, and possibly the specific, level of abstraction. That generic names are preferred by children has implications for science curriculum development. In the dissertation study, the author found that the text used by these informants (Silver Burdett Science, 1985) relied heavily on levels of naming more abstract than the generic. Abstract categories such as monocot and dicot were introduced in the fourth grade while the generic and specific levels of the scientific taxonomic scheme were not mentioned before the seventh grade (Tull, 1990).

The natural ability of children to recognize plants at the generic level was largely ignored by the text. Ausubel, Novak, and Hanesian (1978) point out the importance of relating scientific knowledge to the knowedge of the child. The elementary science text did not reflect the knowledge base of the child nor did it attempt to bridge the gap between the classification scheme used by the child and that used by botanists. This study indicates that the elementary science student should be introduced to the generic and specific levels of the scientific classification scheme long before the more abstract levels of the taxonomy.

It is apparent that student concerns influence how they respond to questions. Teachers need to be aware of the concerns of their students. Strategies students use to avoid admitting ignorance or being wrong suggest a need to examine teacher expectations.

Student concerns indicate that teachers do not encourage students to admit ignorance or express wrong answers. The author poses the following questions for further study: What interactions occur between teachers and students in the classroom that result in these concerns? Is their a relationship between student success or failure and these concerns?

The author finds that students' wrong answers often are educated guesses, that is, they are not random responses. Rather, student guesses indicate strong observation skills and a greater knowledge of plant names than the percentage of incorrect names implies (Tull, 1990). The expression of an incorrect name for a plant involves the formation of an inference. The author suspects that when students are encouraged to express their inferences, they are being encouraged to participate in the scientific process. Further study is needed to evaluate what happens in a classroom in which students are encouraged to admit what they do not know and to express and compare their educated guesses with other students.

Appendix

Percentage of Response Types for Each Informant in Slide and Outdoor Tasks

	Informants																	
	1		2		3		4		5		6		7		8		9	
Response Types	S	O	S	O	S	O	S	O	S	O	S	O	S	O	S	O	S	O
% Life form Responses	45	54	40	49	15	35	55	35	37	39	31	45	57	65	60	58	17	31
% Generic Responses	52	44	32	31	51	27	32	35	42	40	63	38	37	31	37	25	54	40
% Correct Responses	23	24	12	17	12	17	15	28	25	27	32	16	14	8	20	17	17	12
% Incorrect Responses	29	20	20	14	38	10	17	7	17	14	31	22	23	22	17	8	37	29
% Unnamed Responses	3	2	28	20	34	38	12	30	22	21	6	16	6	4	3	17	29	29

Note. S = slide task; O = outdoor task

Number of Cases in which Informants Use each Response Type, in Slide Task and Outdoor Task

	Informants																	
	1		2		3		4		5		6		7		8		9	
Response Types	S	O	S	O	S	O	S	O	S	O	S	O	S	O	S	O	S	O
Made-up Generics	3	3	5	0	17	2	1	1	1	2	2	1	7	8	3	3	12	8
Specific Responses	1	0	0	1	1	2	0	0	0	1	0	0	0	0	0	0	1	1
Life forms Described	0	17	7	31	0	2	1	9	13	7	7	23	8	5	2	4	0	4
Description Alone	0	1	3	13	1	8	0	8	4	4	3	10	4	2	1	3	2	9
Says,"I don't know"	2	0	14	4	0	5	8	14	10	10	14[a]	2	0	0	0	5	0	3
No Response	0	0	0	0	20	5	0	0	0	0	0	0	0	0	0	0	16	0

Note. S = slide task; O = outdoor task

[a]=Only when giving a name

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